

Complementary low voltage transistor

Features

■ Products are pre-selected in DC current gain

Application

■ General purpose

Description

These epitaxial planar transistors are mounted in the SOT-32 plastic package. They are designed for audio amplifiers and drivers utilizing complementary or quasi-complementary circuits. The NPN types are the BD135 and BD139, and the complementary PNP types are the BD136 and BD140.

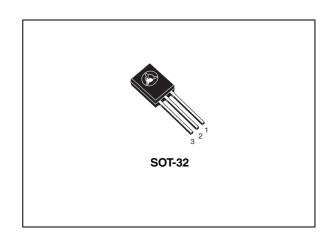


Figure 1. Internal schematic diagram

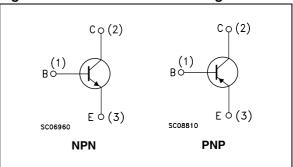


Table 1. Device summary

Order codes	Marking	Package	Packaging	
BD135	BD135			
BD135-16	BD135-16			
BD136	BD136			
BD136-16	BD136-16			
BD139	BD139	SOT-32	Tube	
BD139-10	BD139-10	301-32	Tube	
BD139-16	BD139-16			
BD140	BD140			
BD140-10	BD140-10			
BD140-16	BD140-16			

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter		NPN		PNP	
		BD135	BD139	BD136	BD140	
V_{CBO}	Collector-base voltage (I _E = 0)	45	80	-45	-80	V
V _{CEO}	Collector-emitter voltage (I _B = 0) 45 80		-45	-80	V	
V _{EBO}	Emitter-base voltage (I _C = 0) 5		-	-5		
I _C	Collector current	1.5 -1.5		.5	Α	
I _{CM}	Collector peak current	3		-3		Α
I _B	Base current	0.5		-0.5		Α
P _{TOT}	Total dissipation at T _c ≤25 °C		12	2.5		W
P _{TOT}	Total dissipation at T _{amb} ≤25 °C	1.25			W	
T _{stg}	Storage temperature -65 to 150			°C		
T _j	Max. operating junction temperature 150			°C		

Table 3. Thermal data

Symbol	Parameter	Max value	Unit
R _{thj-case}	Thermal resistance junction-case	10	°C/W
R _{thj-amb}	Thermal resistance junction-ambient	100	°C/W

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2 Electrical characteristics

(T_{case}= 25 °C unless otherwise specified)

Table 4. On/off states

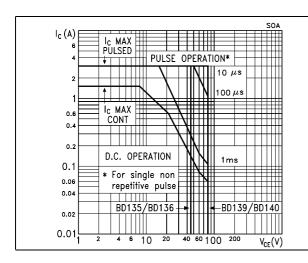
Symbol	Parameter	Polarity	Toot conditions	Value			Unit
Symbol			Test conditions	Min.	Тур.	Max.	Unit
	Collector cut-off current (I _E =0)	NPN	V _{CB} = 30 V			0.1	μΑ
I _{CBO}		141.14	$V_{CB} = 30 \text{ V}, T_{C} = 125 ^{\circ}\text{C}$			10	μΑ
ОВО		PNP	V _{CB} = -30 V			-0.1	μΑ
			$V_{CB} = -30 \text{ V}, T_{C} = 125 ^{\circ}\text{C}$			-10	μΑ
I _{EBO}	Emitter cut-off current	NPN	V _{EB} = 5 V			10	μΑ
EBO	(I _C =0)	PNP	$V_{EB} = -5 V$			-10	μΑ
V (1)	Collector-emitter	NPN	I _C = 30 mA BD135 BD139	45 80			< <
V CEO(sus)`	V _{CEO(sus)} ⁽¹⁾ sustaining voltage (I _B =0)	PNP	I _C = -30 mA BD136 BD140	-45 -80			V V
v (1)	Collector-emitter saturation voltage	NPN	$I_C = 0.5 \text{ A}, I_B = 0.05 \text{ A}$			0.5	٧
V _{CE(sat)} (1)		PNP	I _C = -0.5 A, I _B = -0.05 A			-0.5	V
v (1)	D	NPN	$I_C = 0.5 A, V_{CE} = 2 V$			1	V
V _{BE} ⁽¹⁾	Base-emitter voltage		$I_C = -0.5 \text{ A}, V_{CE} = -2 \text{ V}$			-1	V
h (1)	DC current gain	NPN	$I_C = 5 \text{ mA}, V_{CE} = 2 \text{ V}$ $I_C = 150 \text{ mA}, V_{CE} = 2 \text{ V}$ $I_C = 0.5 \text{ A}, V_{CE} = 2 \text{ V}$	25 40 25		250	
h _{FE} ⁽¹⁾	DC current gain	PNP	$I_C = -5 \text{ mA}, V_{CE} = -2 \text{ V}$ $I_C = -150 \text{ mA}, V_{CE} = -2 \text{ V}$ $I_C = -0.5 \text{ A}, V_{CE} = -2 \text{ V}$	25 40 25		250	
h _{FE} ⁽¹⁾	h _{FE} groups	NPN	I _C = 150 mA, V _{CE} = 2 V BD139-10 BD135-16/BD139-16	63 100		160 250	
		PNP	I _C = -150 mA, V _{CE} = -2 V BD140-10 BD136-16/BD140-16	63 100		160 250	

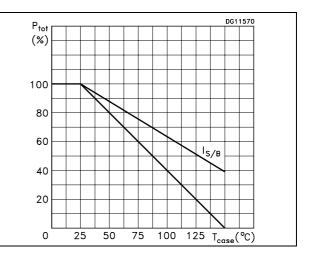
^{1.} Pulsed: pulse duration = 300 μ s, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

Figure 3. Derating



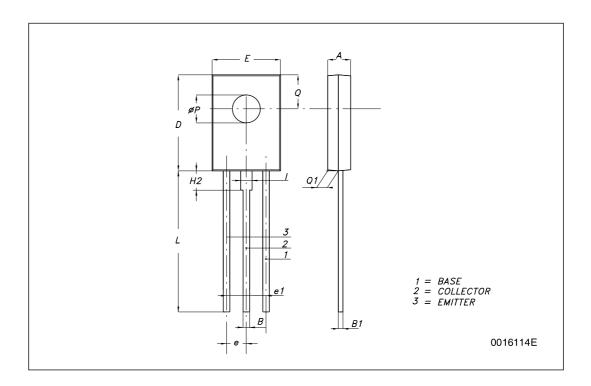


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3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

DIM	mm.				
DIM.	MIN.	TYP	MAX.		
А	2.4		2.9		
В	0.64		0.88		
B1	0.39		0.63		
D	10.5		11.05		
E	7.4		7.8		
е	2.04	2.29	2.54		
e1	4.07	4.58	5.08		
L	15.3		16		
Р	2.9		3.2		
Q		3.8			
Q1	1		1.52		
H2		2.15			
ı		1.27			



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4 Revision history

Table 5. Document revision history

Date	Revision	Changes
16-Sep-2001	4	
22-May-2008	5	Mechanical data has been updated.

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